

## Quadratics

Graph the function.

(check using calculator)

1.  $y = x^2 - 1$

$V(0, -1)$

2.  $y = x^2 - 2x + 1$

$h = \frac{2}{2(1)} = 1$

$k = 0$

$V(1, 0)$

3.  $y = 2(x - 1)^2$

$V(1, 0)$

4.  $y = -(x + 2)(x - 2)$

$V(0, -4)$

5.  $y = x^2 - 2x - 3$

$h = \frac{2}{2(1)} = 1$

$k = -4$

$V(1, -4)$

6.  $y = \frac{1}{2}x^2 - \frac{1}{2}x - \frac{23}{8}$

$h = \frac{1}{2}$

$k = \frac{1}{2}\left(\frac{1}{4}\right) - \frac{1}{2}\left(\frac{1}{2}\right) - \frac{23}{8}$   
 $= \frac{1}{8} - \frac{1}{4} - \frac{23}{8} = -3$

7.  $y = -2(x - 1)^2 + 5$

$V(1, 5)$

8.  $y = 4(x - 2)(x - 4)$

$h = \frac{2+4}{2} = \frac{2+4}{2} = 3$

$k = 4(3-2)(3-4)$

$= -4$

$V(3, -4)$

9.  $y = -\frac{3}{2}(x + 2)^2 + 5$

$V(-2, 5)$

## Factor

10.  $x^2 - 49$

$(x + 7)(x - 7)$

11.  $q^2 - 11q + 24$

$(q - 11)(q - 3)$

12.  $9v^2 - 13v + 4$

$9v^2 - 9v - 4v + 4$

$9v(v - 1) - 4(v - 1)$

$(9v - 4)(v - 1)$

13.  $x^4 - 81$

$(x^2 - 9)(x^2 + 9)$

$(x + 3)(x - 3)(x^2 + 9)$

24.  $8x^3 - 125$

$(2x - 5)(4x^2 + 10x + 25)$

15.  $(18x^3 - 9x^2)(-18x + 9)$

$9x^2(2x - 1) - 9(2x - 1)$

$9(x^2 - 1)(2x - 1)$

$9(x + 1)(x - 1)(2x - 1)$

16.  $x^{2n} + 3x^n - 10$

$(x^n + 5)(x^n - 2)$

17.  $2x^2 - 7x - 9$

$2x^2 + 2x - 9x - 9$

$2x(x + 1) - 9(x + 1)$

$(2x - 9)(x + 1)$

18.  $16x^3 + 250$

$2(8x^3 + 125)$

$2(2x + 5)(4x^2 - 10x + 25)$

Solve the quadratic equation by the indicated method.

## Zero-Product Property

19.  $4x^2 - 6x - 18 = 0$

$2(2x^2 - 3x - 9) = 0$

$2(2x + 3)(x - 3) = 0$

$2x + 3 = 0$

$x - 3 = 0$

$x = -\frac{3}{2}$

$x = 3$

20.  $t^2 = 6t + 55$

$t^2 - 6t - 55 = 0$

$(t - 11)(t + 5) = 0$

$t = 11$

$t = -5$

### Square-Root

21.  $3a^2 = 24$

$$a^2 = 8$$

$$a = \pm \sqrt{8}$$

$$a = \pm 2\sqrt{2}$$

### Completing the Square

23.  $x^2 - 6x + 5 = 0$

$$x^2 - 6x = -5$$

$$x^2 - 6x + 9 = -5 + 9$$

$$(x-3)^2 = 4$$

$$x-3 = \pm \sqrt{4}$$

$$x = 3 \pm 2$$

$$x = 5, x = 1$$

### Quadratic Formula

25.  $2x^2 + 6x + 5 = 0$

$$x = \frac{-6 \pm \sqrt{36 - 4(2)(5)}}{2(2)}$$

$$x = \frac{-6 \pm \sqrt{36 - 40}}{4}$$

$$x = \frac{-6 \pm \sqrt{-4}}{4} = \frac{-6 \pm 2i}{4} = \frac{-3 \pm i}{2}$$

### Simplify

27.  $(7-4i) + (8+6i)$

$$15 + 2i$$

28.  $(-2+15i) - (8-3i)$

$$-10 + 18i$$

30.  $\frac{6i}{1-2i} \cdot \frac{1+2i}{1+2i}$

$$\frac{6i + 12i^2}{1 - 4i^2} = \frac{-12 + 6i}{5}$$

31.  $\sqrt{3} \cdot 2\sqrt{3}$

$$6$$

22.  $x^2 + 9 = 0$

$$x^2 = -9$$

$$x = \pm 3i$$

24.  $x^2 - 3x + 5 = 0$

$$x^2 - 3x = -5$$

$$x^2 - 3x + \frac{9}{4} = -5 + \frac{9}{4}$$

$$\left(x - \frac{3}{2}\right)^2 = -\frac{11}{4}$$

$$x - \frac{3}{2} = \pm \sqrt{-\frac{11}{4}}$$

$$x = \frac{3}{2} \pm \frac{i\sqrt{11}}{2}$$

26.  $x^2 + 9x = 10$

$$x^2 + 9x - 10 = 0$$

$$x = \frac{-9 \pm \sqrt{81 - 4(1)(-10)}}{2(1)}$$

$$x = \frac{-9 \pm \sqrt{81 + 40}}{2}$$

$$x = \frac{-9 \pm \sqrt{121}}{2} \quad x = \frac{-9 \pm 11}{2}$$
$$x = 1, -10$$

29.  $(5-i)(9+3i)$

$$45 + 15i - 9i - 3i^2$$

$$45 + 6i + 3$$

$$48 + 6i$$

32.  $\frac{13i}{1-2i} \cdot \frac{1+2i}{1+2i}$

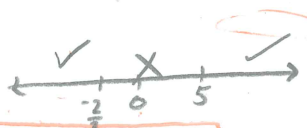
$$\frac{13i + 26i^2}{1 - 4i^2} = \frac{-26 + 13i}{5}$$

Solve the quadratic inequality.

33.  $3x^2 - 13x > 10$

$$\begin{aligned} 3x^2 - 13x - 10 &> 0 \\ (3x^2 - 15x) + (2x - 10) &= 0 \\ 3x(x-5) + 2(x-5) &= 0 \\ (3x+2)(x-5) &= 0 \end{aligned}$$

Crit. #s  
 $-\frac{2}{3}, 5$



Polynomials

$(-\infty, -\frac{2}{3}) \cup (5, \infty)$

Test (1)

$$\begin{aligned} 3(1) - 13(-1) &> 10? \\ 3 + 13 &> 10 \\ 16 &> 10 \end{aligned}$$

Test (6)

$$\begin{aligned} 3(6) - 13(6) &> 10? \\ 6 &> 10 \end{aligned}$$

Test (6)

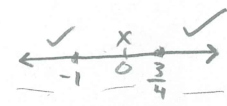
$$\begin{aligned} 3(66) - 13(66) &> 10 \\ 108 - 78 &> 10 \end{aligned}$$

34.  $-4x^2 - x + 3 \leq 0$

$$\begin{aligned} -4x^2 - x + 3 &= 0 \\ (4x^2 - 4x)(3x+3) &= 0 \\ -4x(x+1) + 3(x+1) &= 0 \\ (-4x+3)(x+1) &= 0 \end{aligned}$$

Crit. #s

$\frac{3}{4}, -1$



$(-\infty, -1] \cup [\frac{3}{4}, \infty)$

Test -2

$$\begin{aligned} -4(-2) - (-2) + 3 &\leq 0 \\ -16 + 5 &\leq 0 \\ -11 &\leq 0 \checkmark \end{aligned}$$

Test 0

$$0 - 0 + 3 \leq 0$$

Test 1

$$\begin{aligned} -4(-1) - (-1) + 3 &\leq 0 \\ -5 + 3 &\leq 0 \\ -2 &\leq 0 \end{aligned}$$

State the end behavior of the polynomial function.

35.  $y = -3x^3 - 2x$

$x \rightarrow -\infty$   
 $f(x) \rightarrow +\infty$

$x \rightarrow +\infty$   
 $f(x) \rightarrow -\infty$

36.  $y = x - 3x^3 + 4x^4$

$x \rightarrow -\infty$   
 $f(x) \rightarrow +\infty$

$x \rightarrow +\infty$   
 $f(x) \rightarrow +\infty$

37.  $f(x) = x^5 - 2x^2 + x - 3$

$x \rightarrow -\infty$   
 $f(x) \rightarrow -\infty$

$x \rightarrow +\infty$   
 $f(x) \rightarrow +\infty$

38.  $f(x) = 100x^{21} - 23x^{14}$

$x \rightarrow -\infty$   
 $f(x) \rightarrow -\infty$

$x \rightarrow +\infty$   
 $f(x) \rightarrow +\infty$

39.  $f(x) = -9x^4 + 2x^3 - 3x$

$x \rightarrow -\infty$   
 $f(x) \rightarrow -\infty$

$x \rightarrow +\infty$   
 $f(x) \rightarrow -\infty$